



Northeast Temperate Network

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Ready...Set...Monitor!

What Will Be Monitored?

Knowing the condition of natural resources in national parks is fundamental to the Service's ability to manage park resources. The Inventory and Monitoring Program designs and implements ecological monitoring programs that provide critical information to the National Parks and the public about key vital signs. Vital signs are indicators of ecosystem health, environmental stress, or important species and species groups.

Natural resource monitoring provides site-specific information needed to understand and identify change in complex, variable, and imperfectly understood natural systems.

Detailed monitoring protocols will provide step-by-step guidance for collecting, analyzing, and reporting information for each vital sign. Centralized staffing, agreements with cooperators, and park supported programs are implementing monitoring efforts. In some cases other agencies are already monitoring vital signs (for example, air and climate) and the NPS monitoring program will focus on acquiring data, interpreting, and reporting results.



View of the Hudson from Vanderbilt Mansion NHS

As part of the Service's efforts to improve park management through greater reliance on scientific knowledge, a primary purpose of the monitoring program is to develop, organize, and make available natural resource data. We will transform data into useful information through analysis, synthesis, modeling, and reporting. The information will be available to identify desired conditions and evaluate management effectiveness.



Monitoring Programs for the Northeast Temperate Network

The following monitoring programs will be occurring in the parks starting in 2006:

Breeding Bird Monitoring:

The monitoring will be conducted by volunteers coordinated through the Vermont Institute of Natural Science (VINS). Volunteers will place a placard on the dash designating them as volunteers.

Forest Condition Monitoring:

The plots will be monitored by a forest crew from the State University of New York College of Environmental Science and Forestry (SUNY-ESF). The crew will be driving a university vehicle and will have a placard on the dash designating them as part of the Forest Condition Monitoring crew.

Water Quality Monitoring:

The monitoring will be done by Joe Bartlett, a water technician through the University of Vermont (UVM). Joe will be driving a rental car and will display a placard on the dash designating it as part of the Water Quality monitoring program. Stream and brook sites will have water quality and flow measurements taken. Pond and lake sites will have water quality and level measurements taken.

For more information contact:



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Tweet, Tweet, Tweet! Breeding Landbird Monitoring



Wilson's warbler

Charley Eisman

Birds are an important component of park ecosystems, and their high body temperature, rapid metabolism, and high ecological position in most food webs make them a good indicator of local and regional ecosystem change. In developing comprehensive long-term monitoring plans, landbirds (a general term used to describe relatively small, terrestrial birds, excluding raptors and upland game birds) are among the best taxonomic groups to monitor because:

1. they are the most easily and inexpensively detected and identified vertebrate animals,
2. a single survey method is effective for many species,
3. accounting and managing for many species with different ecological requirements promotes conservation strategies at the landscape scale,
4. many reference datasets and standard methods are available, and
5. the response variability is fairly well understood.

Although the NETN contains 11 parks (including the Appalachian Trail), implementation of landbird monitoring protocols will be limited to the following 8 parks: Acadia NP, Marsh-Billings-Rockefeller NHP, Minute Man NHP, Morristown NHP, Roosevelt-Vanderbilt NHS, Saint-Gaudens NHS, Saratoga NHP, and Weir Farm NHS.

The overall goals of landbird monitoring are to track the status and trends of breeding landbirds within Network parks. Included in

these goals are determining annual changes and long-term trends in species composition, determining annual changes in relative abundance of 10 most commonly detected species at each park, and improving our understanding of breeding bird/habitat relationships and the effects that management actions, such as silviculture practices and mowing regimes, have on bird populations.

Sampling Design: Sampling stations will be laid out systematically and sampled during 10 minute point counts. Distance sampling will be used, and observers will record the horizontal distance to each bird seen or heard during a point count. Bird detections will be placed into 4 distance bands: 0-10m, 10-25m, 25-50m, & >50m.

Site Selection: Three basic criteria were established; 1) point count stations were spaced approximately 250m apart to avoid duplicate sampling while permitting observers to move efficiently between points; 2) stations were located at least 50m from forest edges in order to maximize sampling effort on focal species and avoid fragmentation effects; and 3) stations were located within the dominant, mature forest cover types found in each park. Whenever possible, study sites consist of 10 point counts in order to maximize the amount of data collected per volunteer visit, and at least one station is collocated with a forest condition monitoring site.

Population Being Monitored: Sampling will be limited to the breeding season of migratory landbirds (mid-May through late-June, depending on latitude), and will include those species that may potentially breed in the park.



American Redstart

Charley Eisman

Forest Condition Monitoring



Weir Farm NHS

This protocol has been developed for long-term monitoring of forest vegetation. Our overall goal is to monitor status and trends in the structure, function and condition of NETN forested ecosystems in order to inform

management decisions affecting those systems.

Sampling Design: We have developed a hierarchical approach to forest monitoring that relies on three tiers of information: remote sensing, extensive plots, and intensive plots. Remote sensing is the broadest level and will provide landscape-level data on landuse and fragmentation in and around NETN parks. The extensive tier is designed to assess stand structure and canopy closure, tree condition and regeneration, snag abundance, indicator plant presence, and forest floor condition. The intensive plots will quantify tree growth and mortality rates, understory plant diversity, coarse woody debris, and soil chemistry.

Site Selection: Sites were randomly selected, and at each monitoring site a suite of measurements will be taken (see table below).

Population Being Monitored: The population being monitored is all upland forests and woodlands within park boundaries.



Saratoga NHP

Metric		Objectives
Stand Metrics	Stand structural class	Determine the distribution of structural classes and determine change over time. Compare the distribution of structural classes to that expected under natural disturbance regimes.
	Canopy closure	Determine if canopy closure is decreasing over time. Examine relationships between canopy closure and climatic stress, storms, pest and pathogen outbreaks and other disturbances.
	Snag abundance	Estimate snag abundance and determine change over time. Examine whether management is affecting snags.
	Coarse woody debris (CWD)	Estimate CWD biomass or volume. Determine if CWD is increasing or stable. Examine whether land management and silviculture are reducing CWD.
	Photopoint	Provide visual reference of plots for long-term qualitative comparison.
Tree metrics	Tree condition	Qualitatively assess tree condition and determine if condition of any tree species is declining over time.
	Tree growth and mortality rates	Estimate growth and mortality rates by tree species. Determine if growth rates are declining or if mortality rates are increasing over time. Examine correlation between vital rates and air pollution, pest or pathogen outbreaks, climatic stress or other known stressors.
	Tree regeneration	Quantify canopy tree seedlings and saplings by species and size class. Determine if tree regeneration is increasing or decreasing over time. Determine species composition of tree regeneration.
Understory metrics	Indicator plants	Determine the spatial extent of high priority invasive exotic plant species and track changes over time. Determine population trends of species most palatable to deer, most sensitive to ozone and acid deposition, or at the southern or lower edge of their range.
	Understory diversity	Estimate native understory plant species richness and determine if richness is declining over time. Determine if exotic plant species are increasing in abundance.
Soil metrics	Forest floor condition	Qualitatively assess forest floor condition. Determine the spatial extent of invasive exotic earthworms, a well-developed humus layer, and trampling impacts. Determine change over time.
	Soil chemistry	Determine soil Ca:Al and C:N ratios to assess the extent to which base cation depletion, increased aluminum availability and/or nitrogen saturation are impacting NETN forest soils. Determine whether the impact is increasing over time.
Landscape Metrics	Canopy stress index	Determine the extent and magnitude of canopy stress within NETN forested systems from remotely sensed red reflectance data. Examine correlation between stress and covariates including air pollution exposure, pest and pathogen outbreaks, climatic stress and other known stressors.
	Landscape context	Assess landscape context impacting plot. Determine interior patch size. Determine distance from plot to roads, trails, and other anthropogenic edges. Determine proportion of surrounding area in natural cover and in anthropogenic landuse. Determine change over time.

Water Quality Monitoring



Saint-Gaudens NHS

The overall goal of this protocol is to monitor the status and trends of NETN aquatic resources, to assess changes in ecological integrity and the impacts of key stressors, and to guide management decisions affecting these resources. Identified vital signs that are included in this protocol are water chemistry, nutrient enrichment, water quantity, and the detection of invasive exotic plant species.

Measures of water chemistry, nutrient enrichment and invasive species detection directly address the NPS Inventory and Monitoring objective to detect change in the status of physical, chemical, or biological attributes of ecosystems. Measures of water chemis-

try including pH, dissolved oxygen, water temperature and specific conductance are fundamental to any long-term water quality monitoring program, are important for interpreting the biotic condition and ecological processes of a resource, and are mandatory as directed by the I&M Program at the national level. In addition, acid neutralizing capacity (ANC), color, and turbidity will be measured at all NETN parks. A long term record of these basic water chemistry parameters in the lakes and streams of NETN parks will enable resource management professionals to detect trends that could be related to global and regional climate change and site-specific anthropogenic change.

Nutrient enrichment measures include algal biomass, total and dissolved phosphorus and nitrogen, and water clarity. These measures will give managers guidance regarding the trophic status and productivity of freshwater in parks. Nutrient enrichment and the acceleration of eutrophication have been identified in most NETN parks as one of the stressors of greatest concern.

Measures of stream flow and lake or pond

level will provide important context for interpreting water quality data. Water quantity changes also affect animals ranging from fish to aquatic invertebrates.

The early detection of invasive species has been recognized as a top priority in NETN parks. It was the stressor of biggest concern across all systems in the parks including freshwater aquatic, wetlands, marine, and terrestrial systems.

All accessible lakes and ponds, and all streams (watersheds at Acadia) will be sampled at representative sites. Sampling will occur monthly from May to October.



Morristown NHP

Definitions

Ecological Integrity: a concept that expresses the degree to which the physical, chemical, and biological components (including composition, structure, and process) of an ecosystem and their relationships are present, functioning, and capable of self-renewal. Ecological integrity implies the presence of appropriate species, populations and communities and the occurrence of processes (such as nutrient cycling) at appropriate rates and scales as well as the environmental conditions that support these taxa and processes.

Ecosystem: a spatially explicit unit of the Earth that includes all of the organisms, along with all components of the abiotic environment within its boundaries.

Indicators: a subset of monitoring attributes that are particularly information-rich in the sense that their values are somehow indicative of the quality, health, or integrity of the larger ecological system to which they belong. Indicators are a selected subset of the physical, chemical, and biological elements and processes of natural systems that are

selected to represent the overall health or condition of the system.

Measures: specific feature(s) used to quantify an indicator, as specified in a sampling protocol. For example, pH, temperature, dissolved oxygen, and specific conductivity are all measures of water chemistry.

Metrics: analytical units derived from one or more measures (e.g. basal area, stand structural class, or species diversity).

Monitoring: collection and analysis of repeated observations or measurements to evaluate changes in condition or progress toward meeting a management objective. Detection of a change or trend may trigger a management action, or it may generate a new line of inquiry. Monitoring is often done by sampling the same sites over time, and these sites may be a subset of the sites sampled for the initial inventory.

Protocol: detailed study plans that explain how data are to be collected, managed, analyzed and reported and are a key component of quality assurance for natural resource monitoring programs.

Trend: refers to directional change measured in

resources by monitoring their condition over time. Trends can be measured by examining individual change (change experienced by individual sample units) or by examining net change (change in mean response of all sample units).

Vital Signs: a subset of physical, chemical, and biological elements and processes of park ecosystems that are selected to represent the overall health or condition of park resources, known or hypothesized effects of stressors, or elements that have important human values. The elements and processes that are monitored are a subset of the total suite of natural resources that park managers are directed to preserve "unimpaired for future generations," including water, air, geological resources, plants and animals, and the various ecological, biological, and physical processes that act on those resources. Vital signs may occur at any level of organization including landscape, community, population, or genetic level, and may be compositional (referring to the variety of elements in the system), structural (referring to the organization or pattern of the system, or functional (referring to ecological processes).

Park-Specific Details



Boulder Beach, Acadia NP

Acadia National Park

Breeding Bird Monitoring:

Monitoring is being conducted each year at 80 point count stations. 50 of these have been established in 2006. Ecologically similar count locations are grouped into 9-16 study sites.

Forest Condition Monitoring:

Monitoring will be conducted on 132 plots; 38 have been installed in 2006, 33 will be installed in 2007 and 2008 and 28 in 2009, with 11 established plots revisited each year beginning in 2007. There will also be 10 rare community plots, 5 established in 2007 and 5 in 2009. The crew conducted sampling from June 7-july 13.

Water Quality Monitoring:

Monitoring is occurring at 17 pond and lake sites and 20 stream sites. On a yearly basis 11 pond/lake sites and 12 stream sites will be visited from May-October. There are 8 permanent pond and lake sites and 3 permanent stream sites that will be visited every year. The remaining sites will be on 2 (streams) and 3 (pond and lake) year rotations.

Marsh-Billings-Rockefeller NHP

Breeding Bird Monitoring:

Monitoring is being conducted each year at 25



The Mansion, Marsh-Billings-Rockefeller NHP

point count stations. Ecologically similar count locations are grouped into 3-5 study sites.

Forest Condition Monitoring:

Monitoring will be conducted on 24 plots; 12 will be installed in 2006 and 12 in 2008. The start date is the week of July 24, 2006.

Water Quality Monitoring:

Monitoring is occurring monthly at 1 brook site and 1 pond site: Pogue Brook and the Pogue.



North Bridge over the Concord River, Minute Man NHP

Minute Man NHP

Breeding Bird Monitoring:

Monitoring is being conducted each year at 27 point count stations. Ecologically similar count locations are grouped into 3-5 study sites.

Forest Condition Monitoring:

Monitoring will be conducted on 20 plots; 10 have been installed in 2006 and 10 will be installed in 2008. The crew conducted sampling from July 17-july 21.

Water Quality Monitoring:

Monitoring is occurring monthly for 6 months at 2 brook sites: Mill Brook and Elm Brook. Both sites will have water quality and flow measurements taken.

Morristown NHP

Breeding Bird Monitoring:

Monitoring is being conducted each year at 30 point count stations. These have been established in 2006. Ecologically similar count locations are grouped into 3-6 study sites.

Forest Condition Monitoring:

Monitoring will be conducted on 28 plots; 14



Fort Nonsense, Morristown NHP

will be installed in 2007 and 14 in 2009.

Water Quality Monitoring:

Monitoring is occurring at 5 stream sites: Indian Grove, Primrose Brook, East Branch of Primrose Brook, West Branch of Primrose Brook, and the Passaic River.

Roosevelt-Vanderbilt NHS

Breeding Bird Monitoring:

Monitoring is being conducted each year at 30 point count stations. These have been established in 2006. Ecologically similar count locations are grouped into 3-5 study sites. In 2006 monitoring was conducted by NPS staff. For 2007 monitoring will be conducted by volunteers coordinated through the Vermont Institute of Natural Science (VINS).

Forest Condition Monitoring:

Monitoring will be conducted on 44 plots; 22 will be installed in 2007 and 22 in 2009.

Water Quality Monitoring:

Monitoring is occurring at 6 stream sites. Vanderbilt Mansion NHS has Crum Elbow Creek monitored where it enters and exits the park. The Home of FDR NHS has the unnamed stream monitored where it enters and exits



Vanderbilt Mansion, Roosevelt-Vanderbilt NHS

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Park-Specific Details

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the park. Eleanor Roosevelt NHS has Fall Kill stream monitored downstream of upper Val-Kill Pond. The Meriches Kill stream is being monitored on the land between the Home of FDR NHS and Eleanor Roosevelt NHS.

Saint-Gaudens NHS

Breeding Bird Monitoring:

Monitoring is being conducted each year at 5 point count stations, which make up one study site. The study site is surveyed twice annually, with replicates occurring about 7-14 days apart.

Forest Condition Monitoring:

Monitoring will be conducted on 20 plots; 10 will be installed in 2006 and 10 in 2008. The start date is August 3, 2006.

Water Quality Monitoring:

Monitoring is occurring at 2 stream sites and 1 pond site: Blow-Me-Up Brook, Blow-Me-Down Brook, and the Blow-Me-Down Pond.



Aspet & Mt Ascutney, Saint-Gaudens NHS

Saratoga NHP

Breeding Bird Monitoring:

Monitoring is being conducted each year at 30 forested and 25 grassland point count stations. These were established in 2006. Ecologically similar count locations are grouped into 3-6 forested and 2-5 grassland study sites.



Cannons overlooking the Hudson River, Saratoga NHP

Forest Condition Monitoring:

Monitoring will be conducted on 32 plots; 16 will be installed in 2006 and 16 in 2008. The start date is August 14, 2006.

Water Quality Monitoring:

Monitoring is occurring at 4 stream sites: Kroma Kill, Mill Creek, North Fork Mill Creek, and American Creek.

Saugus Iron Works NHS

Water Quality Monitoring:

Monitoring is occurring at the USGS Gaging Station on the Saugus River. Grab samples have been taken in June and will be taken again in August.

Saugus River, Saugus Iron Works NHS



Weir Farm NHS

Breeding Bird Monitoring:

Monitoring is being conducted each year at 5 point count stations, which make up one study site. The study site is surveyed twice annually, with replicates occurring about 7-14 days apart.

Forest Condition Monitoring:

Monitoring will be conducted on 10 plots; 5 will be installed in 2007 and 5 in 2009.

Water Quality Monitoring:

Monitoring is occurring at 1 pond site: Weir Pond. The pond has water quality and pond level measurements taken.



Weir's Studio, Weir Farm NHS

Upcoming Monitoring Projects

Freshwater Wetlands Monitoring: This will occur in all parks with freshwater wetlands. Draft protocols will be finished September 29, 2006, and they will be field evaluated in FY 2007.

Rocky Intertidal: Acadia NP and Boston Harbor Islands will be using this protocol. The protocol is being developed by the University of Maine and is expected to be evaluated in FY 2008. The tentative plan has volunteers from universities and colleges performing the monitoring protocols.



Marsh on Peddocks Island, Boston Harbor Islands NPA

Coastal Breeding Birds: Boston Harbor Islands NPA will be using this protocol. The protocol is being developed by the University of Rhode Island and is expected to be evaluated in FY 2007. Part of the NETN project will involve evaluating the data collected by volunteers in 2006. Boston Harbor Islands will continue to use volunteer support for this monitoring project.